

Effect of modified damping parameters on AIRS O₃ retrievals

Bill Irion, Michael Gunson – Jet Propulsion Laboratory

Michael Newchurch – U. Alabama at Huntsville

Sunmi Na – Pusan National University

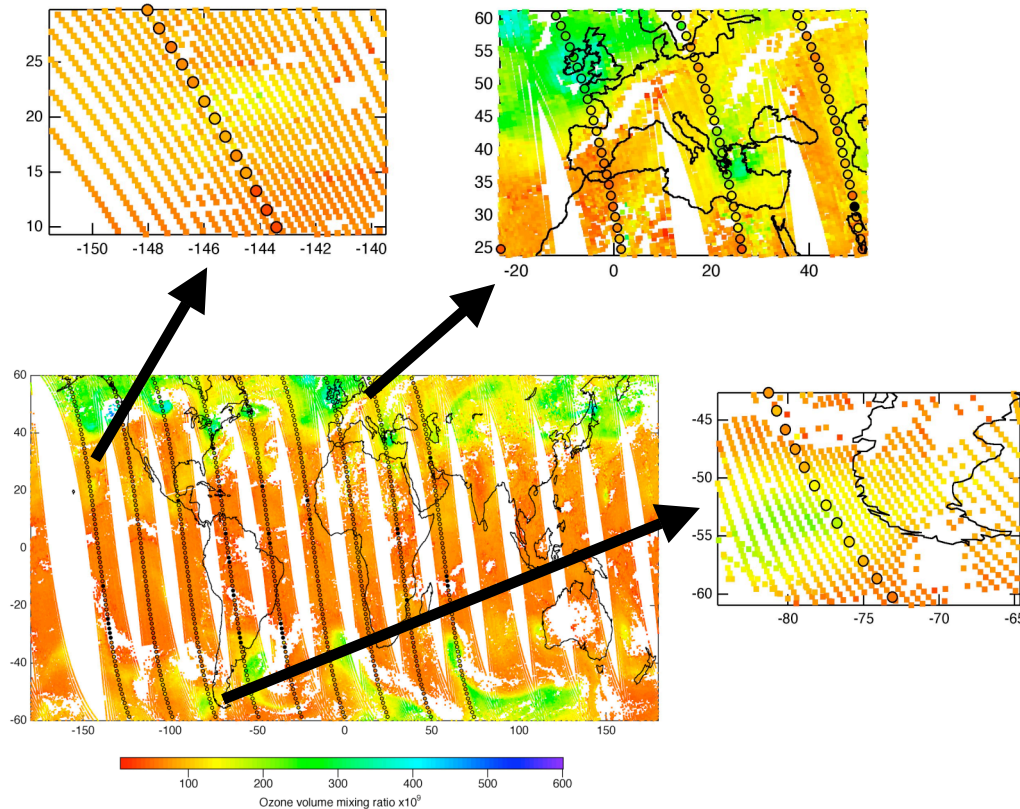
With thanks to Sung-Yung Lee, Bob Oliphant and SHADOZ team

AIRS Team Meeting – March XX, 2006

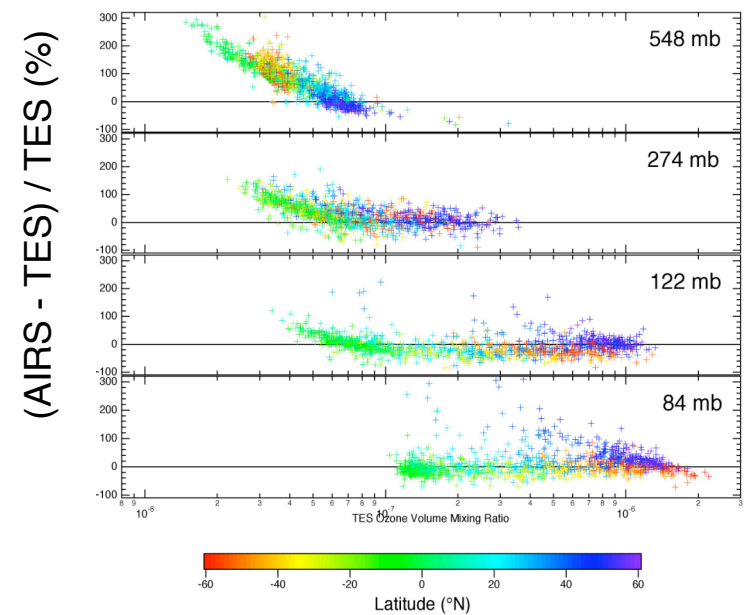
AIRS in qualitative agreement with TES in ozone regions $> 100\text{ppb}$

May 21/2005 270 mb

Filled dots are TES observations

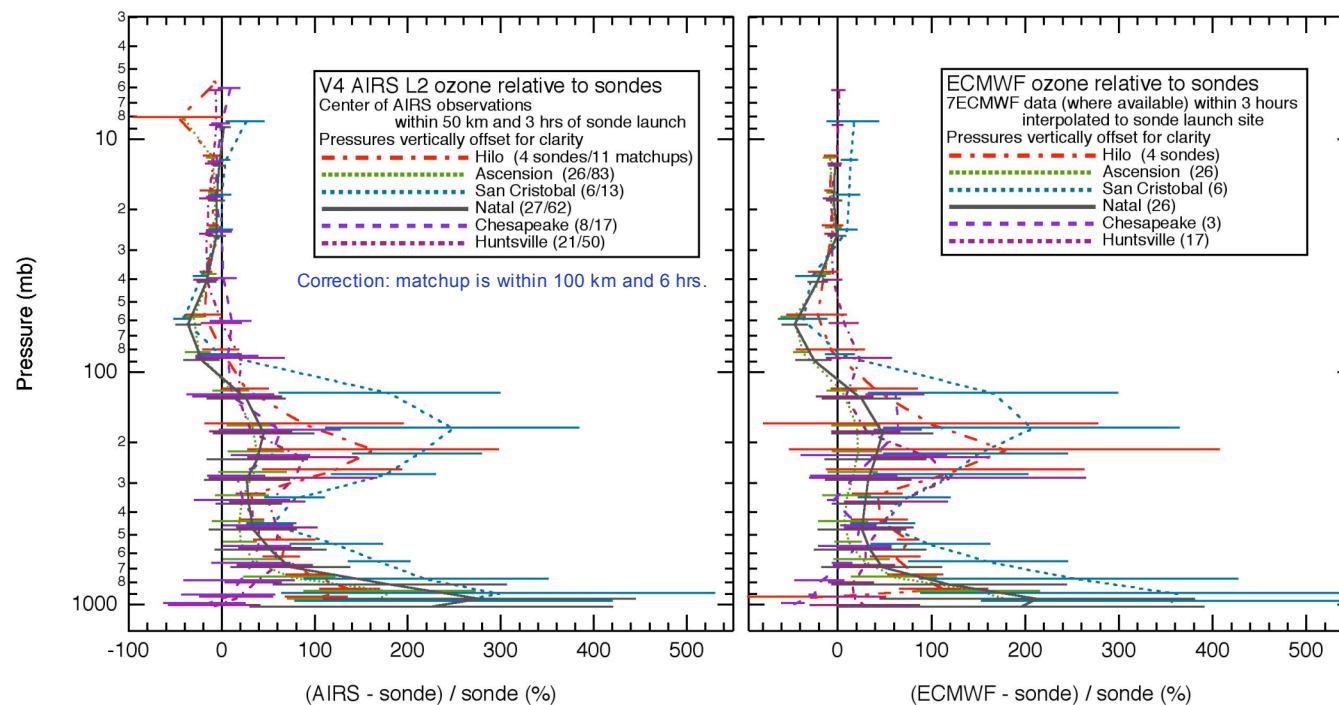


AIRS-TES relative difference



But is AIRS skill in ozone from regression?

Current V4 AIRS ozone and ECMWF compared to coincident sondes



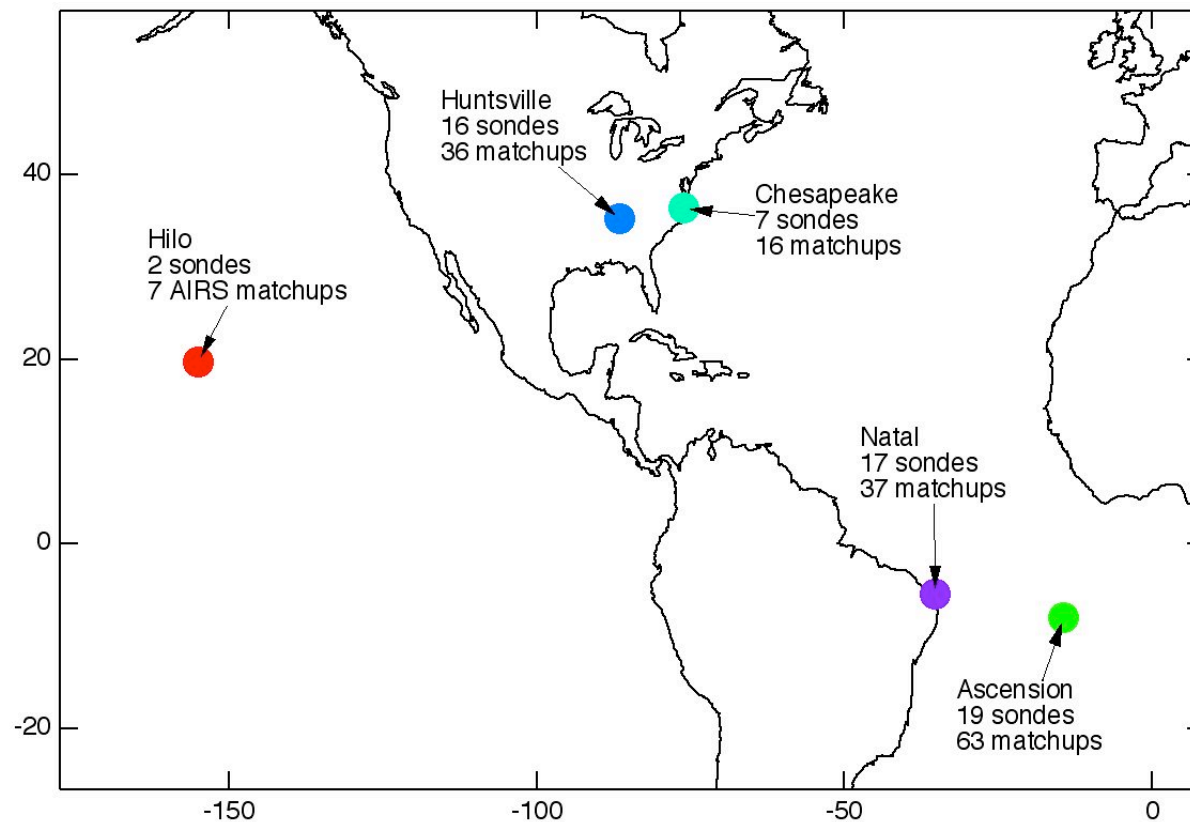
AIRS O₃ *a priori* (regression) tuned to ECMWF.

Like ECMWF, AIRS is too high in troposphere and too low in stratosphere; column OK.

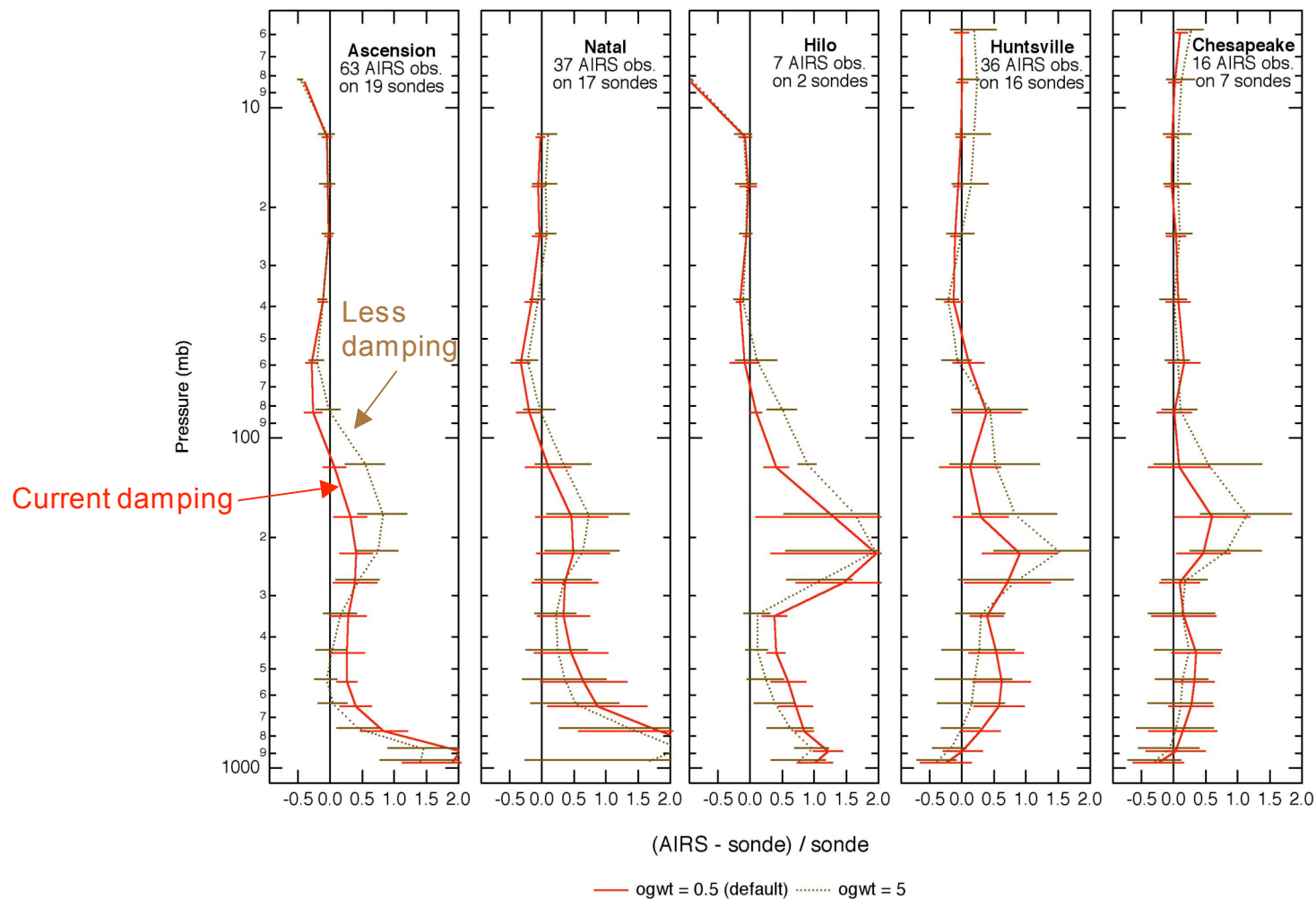
Would reducing the damping help? How would channel changes affect the retrieval with changed damping?

Location map

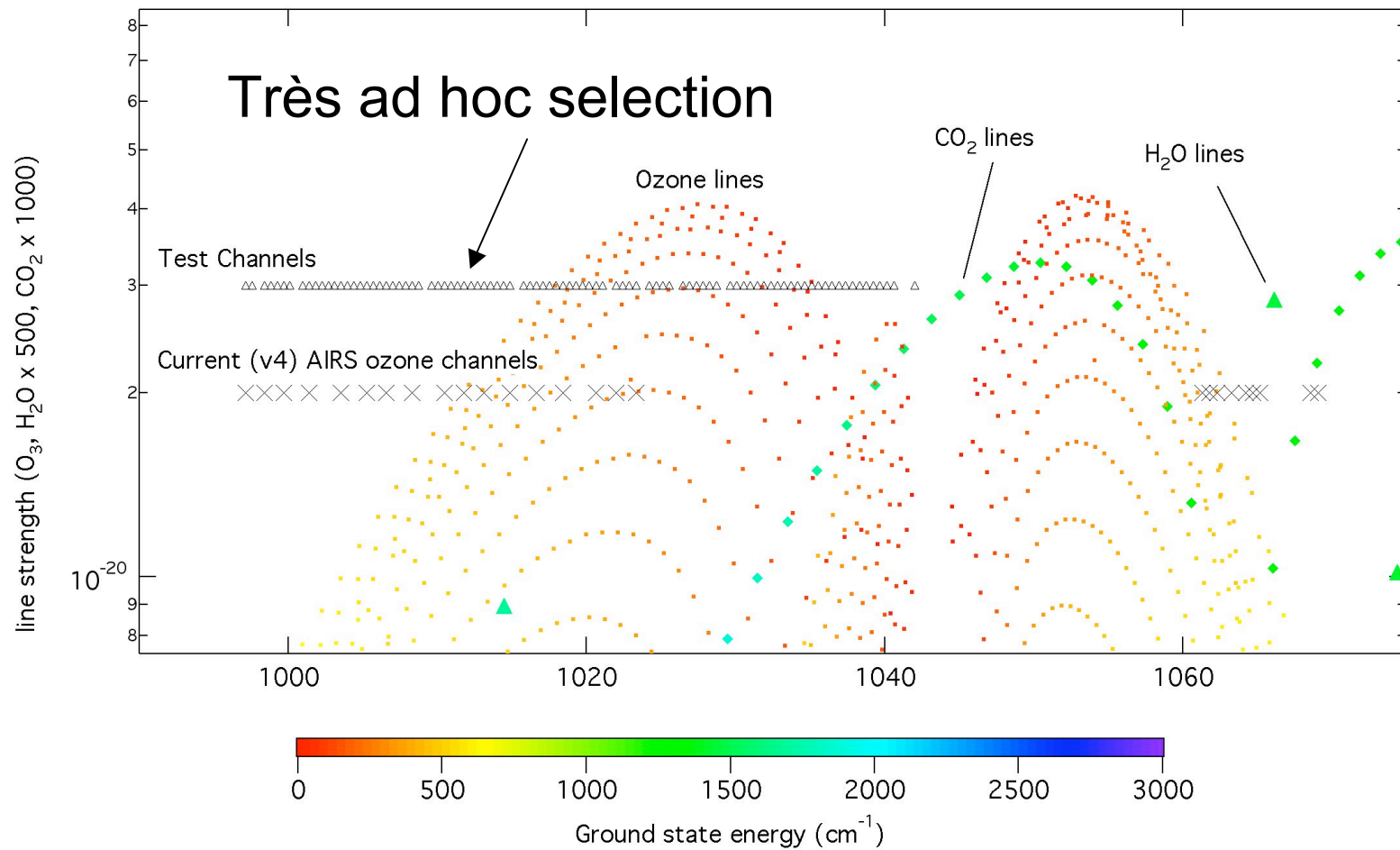
Matchups within 100 km and 3 hrs of sonde launch



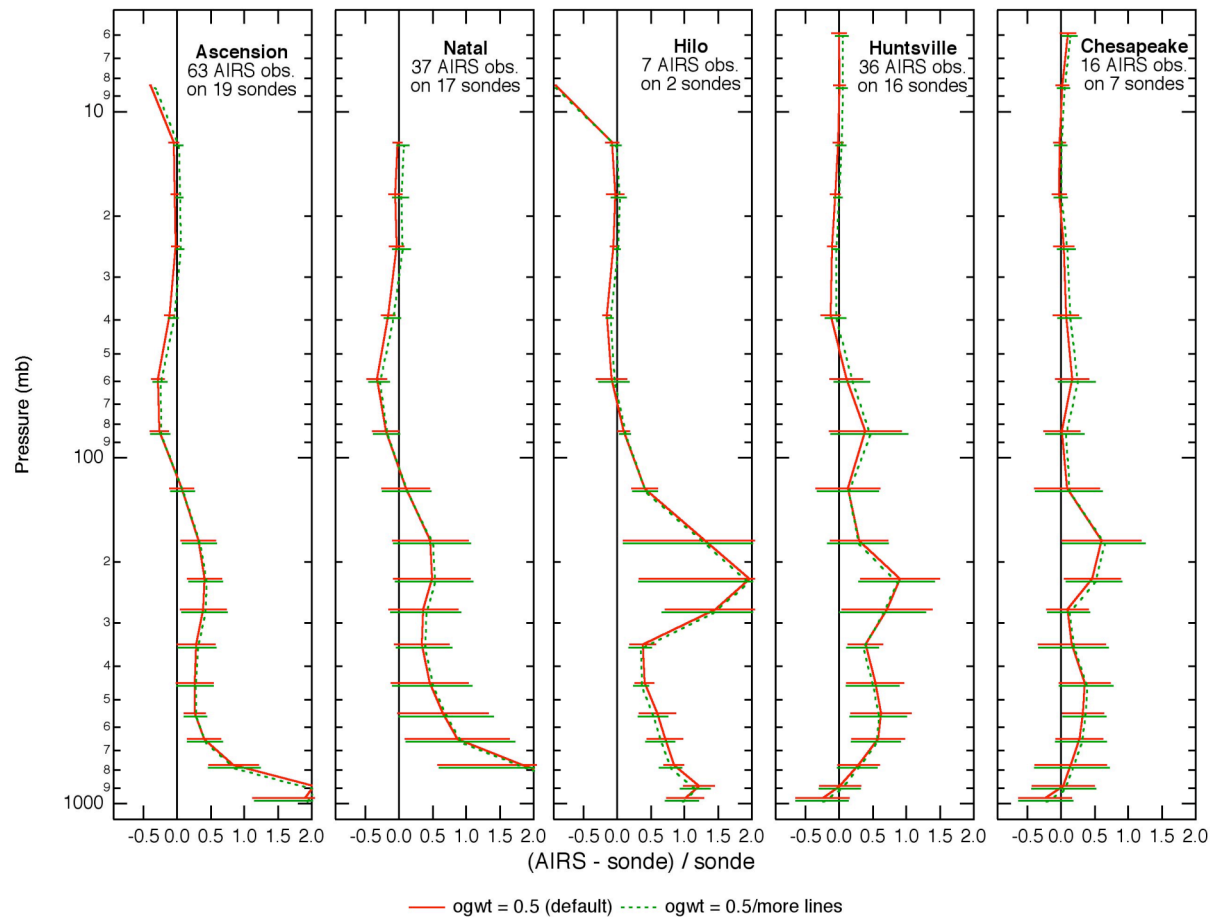
Decreasing damping worsens results in upper trop/lower strat *with current channel selection.*



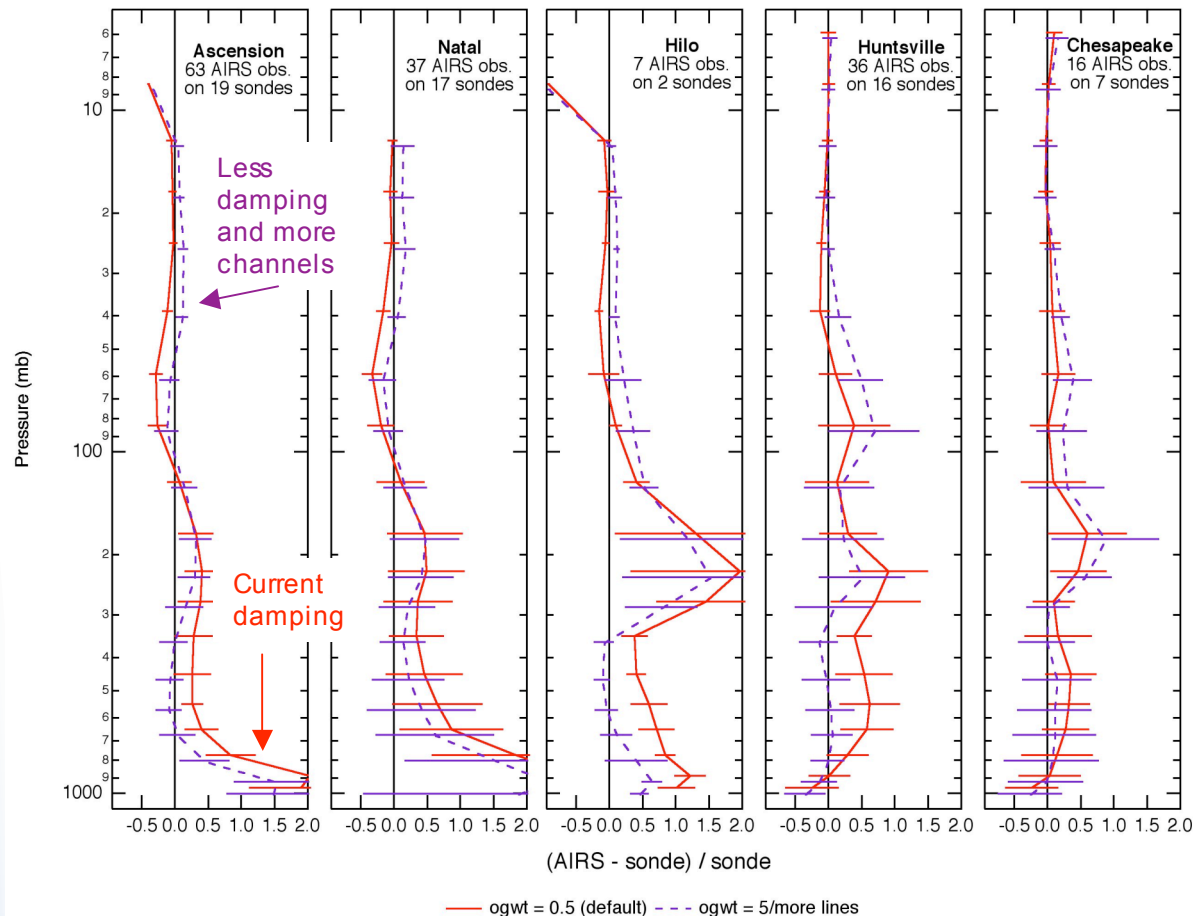
...so let's give the retrieval more information



Adding channels at current damping doesn't help.



Adding channels and decreasing damping gives mixed results

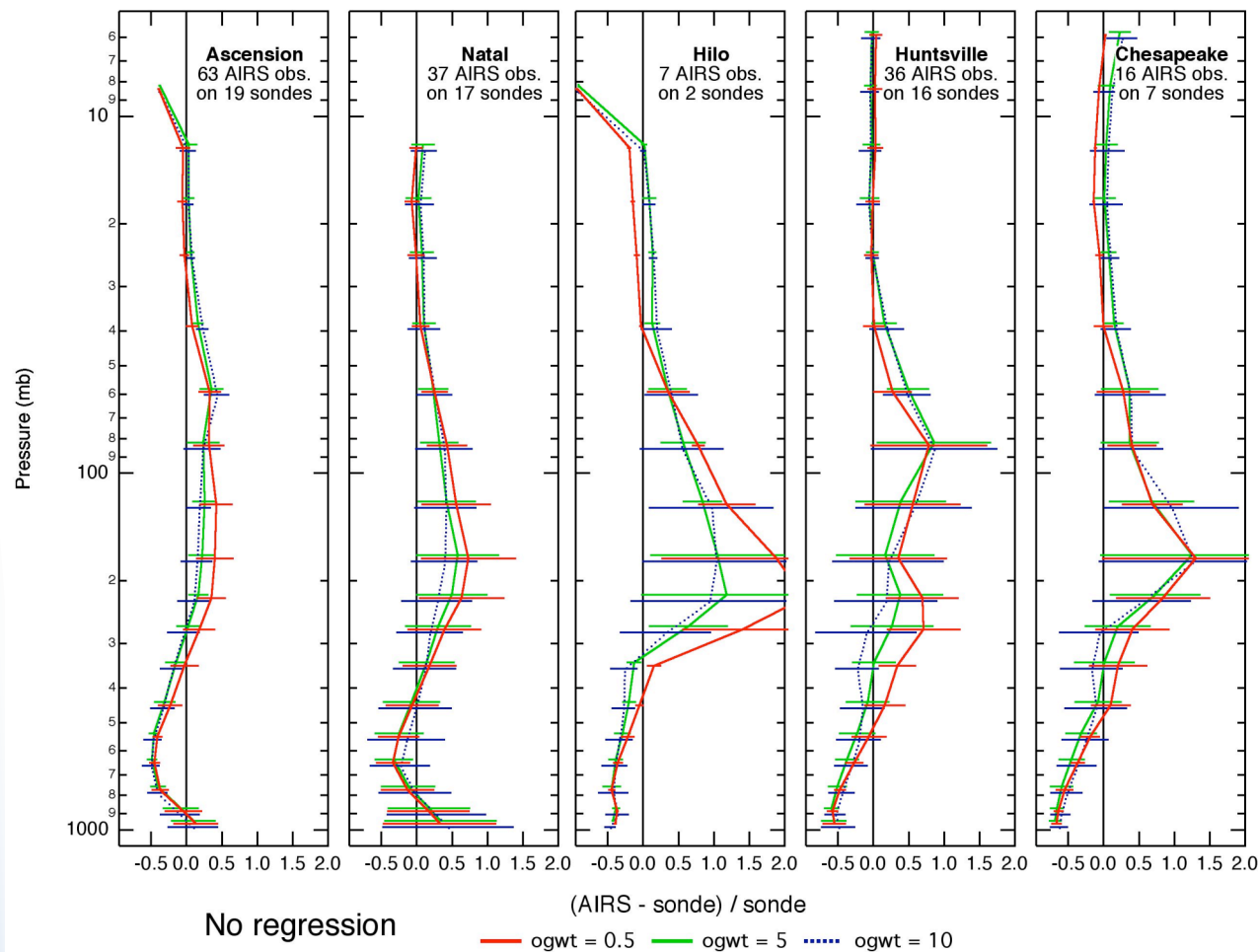


– helps in tropical lower stratosphere (Ascension & Natal).

– mixed results in subtropics at Hilo (but only a couple of sondes)

– worse results in midlatitude lower stratosphere (Huntsville & Chesapeake).

No regression/More lines/Decreased damping



Same a priori
as used in
cloud-clearing.

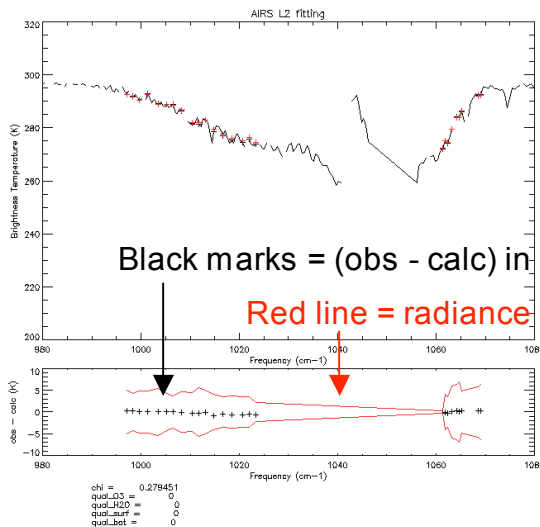
Diminishing
returns? Or
problems in
CC radiance
uncertainties?

But...any changes would be suboptimal without reliable uncertainties in radiances!

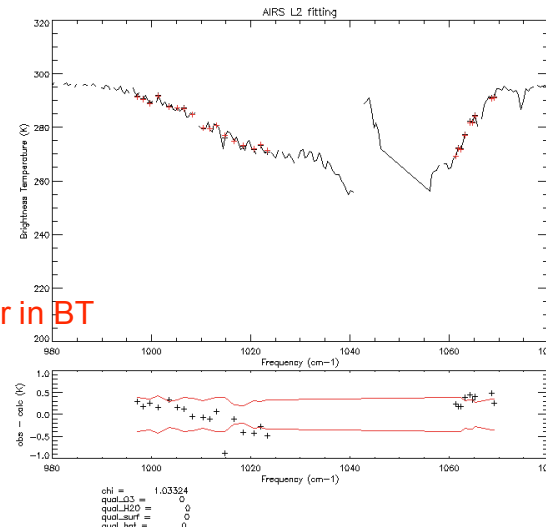
$$\chi = \sqrt{\frac{1}{N} \sum_{i=1}^N \left(\frac{obs_i - calc_i}{NESR_i} \right)^2}$$

If $\chi \gg 1$, bad fits or underestimating noise

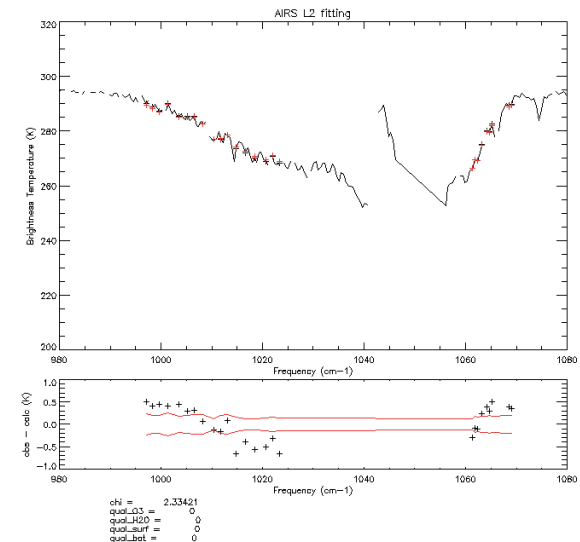
If $\chi \ll 1$, fitting noise or overestimating noise



$$\chi = 0.28$$



$$\chi = 1.03$$



$$\chi = 2.33$$

Systematic biases in radiance uncertainties

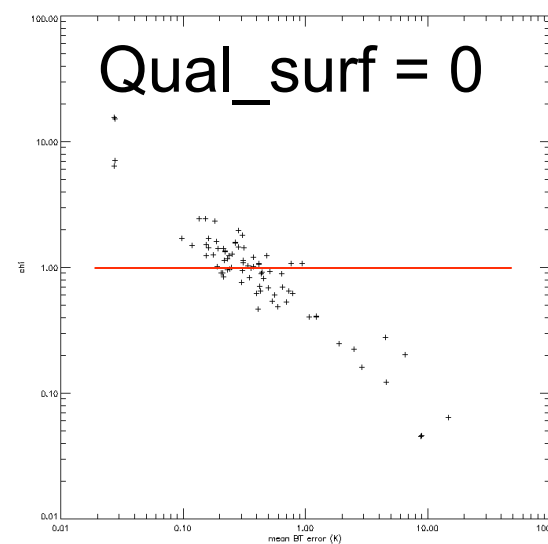
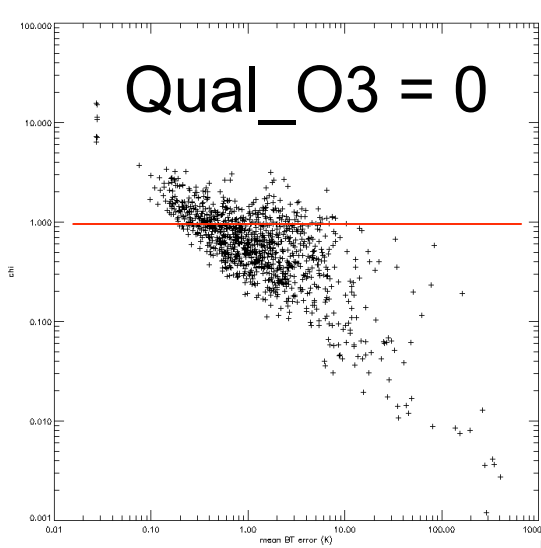
Sept 6/02 V4
Granule 176

$$\chi = \sqrt{\frac{1}{N} \sum_{i=1}^N \left(\frac{obs_i - calc_i}{NESR_i} \right)^2}$$

If $\chi \gg 1$, bad fits or underestimating noise

If $\chi \ll 1$, fitting noise or overestimating noise

χ vs error in BT should be a horizontal line!



Mean BT error for ozone radiances

Conclusions

- Need for reliable uncertainties in cloud-cleared radiances.
- Significant tradespace in ozone channel selection *with* decreased damping.
- Need to determine new regression coefficients (work in progress).
- Re-evaluate channel selection and damping parameter with new coefficients.